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## INSTALLATION METHOD OF PANEL AND RAIL-TYPE FIXING APPARATUS

### Technical Field

5           The present invention relates generally to a method for attaching panels that are, for example, installed on the floors, walls and ceilings of gymnasiums, houses, etc. and to a rail type fixing apparatus for installing the panels. In detail, the present invention relates to a method for attaching panels that do not have defects caused by the expansion and shrinkage of the panels,  
10 even though there are no gaps between the panels in consideration of their expansion and shrinkage caused by temperature variations, and that the user can recycle by simply disassembling them without breaking the materials, and to a rail type fixing apparatus for installing the panels.

### 15   Background Art

Generally, installation panels attached to the floors, walls and ceilings of gymnasiums or houses are made of long, flat cut wood with a certain length, width and depth, and they are attached by inserting, fitting and assembling several panels sequentially.

20           Fig. 1 is a perspective view showing a general method in which the installation panels are assembled and attached to an attachment surface A. According to the Fig. 1, long wooden supports 100 are arranged at fixed intervals sequentially, and the panels 101 are assembled on the supports 100.

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At this time, the panels 101 have projections 104, 105 and insertion grooves 102, 103 formed on the long edge and the short edge, are assembled and attached sequentially in an insertion and fitting method using the projections 104, 105 and insertion grooves 102, 103 and are fixed firmly by adhering the  
5 panels 101 to the supports 100 using fixing means such as nails or adhesives.

Since the panels 101 are made of wood, they are expanded and shrunk in accordance with the environment of depository or installation, that is, the variations of temperature and humidity. Generally, the total amount of expansion or shrinkage of the panels in the length is not severe, so that there is  
10 no defect in that direction. However, the amount of expansion or shrinkage of the panels in the width is severe.

Accordingly, when the panels 101 are shrunk, a gap between the panels widens and a space is formed so that alien substances can be put into the space. Also, it can spoil the beauty of the floor surface. In the case where  
15 the panels are expanded, their width widen, so that the panels 101 are stuck fast in the direction of width and accordingly there occurs a protrusion problem in which any assembled portion of the panels 101 cannot resist the expansion force and the portion rises as shown in Fig. 3(a).

Due to this problem, when making a installation of the inserting and  
20 fitting type panels, an extra gap  $x$  between panels 101 should be placed assuming that a displacement length caused by expansion of one panel is  $x$ . Fig. 2 shows an example of conventional panel attachment method, wherein the case that the extra gap  $5x$  is placed every 5 panels 101, spacers 106 of  $5x$

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size should be inserted into every 5 panels and should be removed after finishing the installation.

However, since this conventional method is to make an extra gap in every determined panels 101 and insert the spacers 106 in consideration of the shrinkage and expansion rate of the panels 101, and remove the spacers 106 again after finishing the installation, the assembling work can't be carried out quickly due to the cumbersome work involved and needs an expert with much experience.

In addition, since the expansion or shrinkage rate of the panels 101 just before installation varies in transport procedure and keeping state and temperature/humidity of the place where the panels are installed, it is very difficult for an amateur to determine the extra gap and even the expert often fails to determine the extra gap precisely, and causes defects due to the shrinkage or expansion after installation.

And if many extra gaps are placed when constructing the panels, in case that the line L is drawn on the panels in the gymnasium or other similar place, the line L won't be drawn smoothly due to the extra gaps as shown in Fig. 3(b). So the appearance will not be good.

Also, when we have to remove the attached panels for repair and demolition, it is difficult to separate the support or panels fixed with nails or strong adhesives, and it even causes a waste of resource and pollution, since the panels are broken and scrapped in the process of removal.

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Disclosure of the Invention

Therefore, the purpose of the present invention is to provide a method and a rail type fixing apparatus for attaching panels, which provides simple and rapid installation even by an amateur, has little defect caused by shrinkage or expansion of the panels due to temperature variations after installation, allows us to separate panels after installation safely so we can recycle them, and allows us to attach panels to the floor, wall and ceiling.

To accomplish this purpose, the present invention is a method for attaching long flat shaped panels with two long edges and two short edges, and the projections provided on one side of long/short edge and the insertion groove on another side of long/short edge, which are inserted and fitted into the insertion grooves so that the panels are sequentially assembled;

characterized in that the method comprising steps of;

inserting the projections of the panel into the insertion grooves of another panel, and;

assembling them flexibly by using elastic force with elastic member so that the assembling portion between assembled panels is adhered closely.

And the present invention is based on a rail type fixing apparatus for attaching long flat shaped panels with two long/short edges, a projection and the first hook groove on one side of the long edges, an insertion groove and the second hook groove on the other side of the long edges;

characterized in that it comprises;

a long shaped rail with a lower surface, which is placed on the

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attachment surface for attaching the panel, an upper surface on which the panel is mounted, and a guide groove in the longitudinal direction;

a plurality of attachment panels guided in the guide groove and installed movably in the longitudinal direction of the rail, and has a hook  
5 projection to which the first hook groove of the panel and the second groove of the other panel are hooked and maintained, and which is projected in the upper direction and formed in the rectangular direction to the longitudinal direction; and

an elastic member arranged elastically between an attachment panel  
10 and an adjacent attachment panel in order to have both hook projections approached each other by the elastic restoring force.

In addition, the first and second support grooves are formed in the longitudinal direction on the bottom of the panel, and support projections are formed on the attachment panel in the same direction of the hook projection,  
15 into which the first and the second support grooves are inserted.

And, a fixing blade extended from the bottom surface of the rail to the horizontal direction is formed, and a plurality of fixing holes is formed on the fixing blade at a fixed interval.

20 Brief Description of the Drawing

Figure 1 is a perspective view showing conventional panel attachment method;

Figure 2 is a plan view showing conventional panel attachment

method;

Figures 3(a) and 3(b) are a plan and a sectional view showing defections in accordance with the conventional panel attachment method;

Figure 4 is a perspective view showing a rail type fixing apparatus for attachment in accordance with the present invention;

Figure 5 is a sectional view for explaining the panels attachment method using the rail type fixing apparatus for attachment in accordance with the present invention;

Figure 6 is an exemplary drawing showing panels attachment method in accordance with the present invention;

Figure 7 is an exemplary drawing showing panel attachment method in accordance with the present invention;

Figure 8 is a perspective view showing another embodiment of a rail type fixing apparatus for attachment in accordance with the present invention;

Figure 9 is a sectional view showing a state of the panels installed using the rail type fixing apparatus for attachment of the embodiment shown in Fig. 8; and

Figure 10 is a perspective view showing a state of panels installed on the ceiling and wall surfaces using the rail type fixing apparatus of the embodiment shown in Fig. 8.

#### Best Mode for Carrying Out the Invention

Now, a preferred embodiment of the present invention will be

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described with reference to the accompanying drawings.

Figure 4 is a perspective view showing the fixing apparatus for attaching the panels to the bottom, wall and ceiling, Figure 5 is a sectional view for explaining the panel attachment method using the fixing apparatus and Figure 6 is a perspective view showing the panels attachment method using the fixing apparatus. At first, the panels 1 are generally made of wood and are of a long flat shape with long/short edges.

The panels 1 have projections 2, 3 on each side of long/short edge, and have the first hook groove 4 under the projection of the long edge 2. Also, insertion grooves 5, 6 are formed on the opposite side of long/short edge and the second hook groove 7 is formed under the insertion groove 5 of the long edge.

So, assembling of a panel 1 and another panel 1 is performed by inserting and fitting the projections 2, 3 of one panel 1 into insertion grooves 5, 6 of another panel 1.

The fixing apparatus 10 is to attach the panel 1 to the attachment surface A of the floor, wall and ceiling and consists of a rail 20, a plurality of attachment panels 30 and an elastic member.

The rail 20 is of a long shape, whose section is rectangular. It has a flat bottom surface 20a placed on the attachment surface A of the floor, the wall and the ceiling for attaching the panel 1; a flat top surface 20b on which the panel 1 is mounted; and a side surface 20c of a predetermined thickness for maintaining the panel 1 in a fixed interval from the attachment surface A.

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Also, the rail 20 forms a path opened to the upper part from the central part and guide grooves 21 are formed on both opposite inner walls in the lower part of the path in the longitudinal direction of the rail. A plurality of attachment panels 30 is movably installed in the guide groove 21 in the  
5 longitudinal direction of the rail 20.

The attachment panel 30 is formed of a flat shape and has guide panels 31 in both edges of their lower part, which are inserted to the guide groove 21 and guided. The attachment panel 30 has a hook projection 32 projecting in the upper direction from its top surface, and the projection 32 is  
10 formed in the rectangular direction to the longitudinal direction of the rail. The first hook groove 4 of the panel 1 and the second hook groove 7 of another panel 1 assembled with the panel 1 are hooked and maintained on both sides of the hook projection 32.

When a plurality of the attachment panels 30 is installed in the rail 20,  
15 the length L1 between a hook projection 21 and an adjacent hook projection 32 in the state that one attachment panel 30 is in contact with an adjacent attachment panel 30 is set to be less than the length L2 between the first hook groove 4 and the second hook groove 7 of the panel 1.

Preferably, the top surface of the hook projection 32 is formed with a  
20 curved surface and makes the hook maintaining operation of the first and the second hook grooves 4, 7 of the panel 1 easy.

The elastic member is installed between one attachment panel 30 and an adjacent attachment panel 30, and operates the elastic restoring force into



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the direction that both hook projections 32 draw each other. For example, in the case where the elastic member is a tension coil spring 40, as shown in Figures 4 and 5, the first and the second hook rings 33, 34 are formed on both sides of the hook projection 32 of the attachment panel 30 on their upper  
5 surfaces so that one end of the tension coil spring is hooked on the first hook ring 33 and the other end is hooked on the second hook ring 34 of the adjacent attachment panel.

The elastic member is not limited to the tension coil spring 40. For example, tension members such as a compression coil spring, a panel spring or  
10 torsion spring can be used, if the tension restoring force acts into the direction to draw the hook projection 32 of the attachment panel 30 each other.

Even though one tension member is shown in Fig. 4, it is not limited to that and the number of the tension member can be varied and the required height between the attachment surface A and the panel 1 can be simply  
15 determined as the side 20c of the rail 20.

Referring to Figs. 5 and 6, it will be described how to attach the panel to the attachment surface with fitting in accordance with the present invention.

At first, fixing apparatuses 10 are arranged on the attachment surface A in a plurality of row spaced in a fixed distance in the direction of their width.  
20 Here, the spaced distance should be shorter than the length of the panel 1. The panel 1 attached for the first time is installed with a extra gap from the wall surface and the first hook groove 4 is inserted and fitted into the hook projection 32.

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Then, in the case that the panel 1 is assembled sequentially, the insertion groove 5 is inclined slightly and inserted into the projection part 2 of the panel 1 which was assembled, and the second hook groove 7 is inserted and fitted in the hook projection 32, and the hook groove 4 is inserted into the hook projection 32 in the opposite side. Since the top surface of the hook projection 32 is a curved surface, the insertion and fitting operation of the first hook groove 4 can be performed easily.

By being assembled sequentially in this way, the panel 1 can be assembled and attached on the rail 20 and the attachment panel 30 simply and rapidly.

Since the length L1 between hook projections 32 is set shorter than the distance L2 between the first hook groove 4 and the second hook groove 7 of the panel 1, when the first hook groove 7 is inserted and fitted in the hook projection 32, the gap between one attachment panel 30 and the adjacent attachment panel 30 is spaced and then the distance between the hook projections 32 is lengthened by  $L2-L1$ , so that the resulting distance will become identical with the distance L2 between the first hook groove 4 and the second hook groove 7 of the panel 1. Accordingly, the tension coil spring 40 is tensioned for that, and one attachment panel 30 and the adjacent attachment panel 30 draw each other by the tension restoring force of the tension coil spring 40 so that the panel 1 is firmly inserted between both the hook projection 32 and fixed in the fixing apparatus 10.

If the fixing apparatus 10 is sequentially arranged in the longitudinal

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direction and assembled sequentially using this method, the panel 1 can be attached simply and rapidly, and the attached panels 1 are stuck fast elastically by the elastic restoring force of the tensioned tension coil spring 40, so that the panels maintain a fixed state firmly as a whole and do not rise or separate from the attachment surface A.

Also, Fig. 7 shows another arrangement of the fitting. When the fixing apparatuses 10 are sequentially arranged in the longitudinal direction, the some end part of them can be overlapped and other various arrangement of the fitting can be performed in order to attach the panel to the attachment surface.

10 In case the panel 1 is shrunk or expanded by temperature variations in accordance with the season or the environment, the tension member can absorb the deformation, and the defects due to the shrinkage and expansion can be prevented.

That is, when the panel 1 is constricted in the direction of width by the variation of the temperature and humidity in the installation place, both hook projections 32 can be drawn as much as the shrinkage by the tension restoring force of the tension coil spring 40, and the tension coil spring 40 can be extended when the panel 1 is expanded. Accordingly, since the tension member can absorb the expansion or the shrinkage of the panel 1 and the connection parts of the panel 1 are always stuck fast by the tension restoring force, it is not necessary to form spaces per every fixed distance like the conventional panel attachment method.

Accordingly, since there is no need to make a space per every fixed

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distance, even an amateur can install the panel. Also, since it is not necessary to insert spacers into the space and remove them after finishing the installation, the installation of the panel 1 is performed more simply and rapidly.

Moreover, defects after the installation occurred by setting the spacer  
5 erroneously, that is, gaps between the panels in the case where the panel is shrunk or protrusions occurred by an expansion force when the panel is expanded can be prevented. Also, when drawing lines on the surface of the panel 1, removing the gap between the panels can draw smooth lines without disconnection, and so the good appearance can be accomplished.

10        Figures 8 and 9 show another embodiment of the present invention. This embodiment is identical with the embodiment described above, except that the first and the second support grooves 8, 9 are formed in the longitudinal direction on the bottom surface of the panel of the above embodiment; support  
15        projections 35, 36 which are inserted into the first support groove 8 and the second support groove 9 are formed on the attachment panel 30 in the same direction as the hook projection 32; and that the rail 20 has fixing blades 22 which are extended from the bottom of the rail in the horizontal direction; and a plurality of fixing holes 23 is formed on the fixing blade 23 at a fixed interval.

20        According to this constitution, the panel 1 is further supported by the first and second support grooves 35, 36 formed on the attachment panel 30, as shown in Fig. 9. Where the panel 1 is attached to the wall surface or the ceiling surface with the fixing blades 22, the rail 20 is fixed on the wall

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surface or the ceiling surface with fittings such as nails, and then the panel 1 is assembled and attached with the same method as the embodiment described above. Thus, since the hook projection 32 formed on the attachment panel 30 of the fixing apparatus 10 sticks and fixes the panel 1 by the elastic restoring  
5 force of the tension member, the panel can be firmly attached without rising or prating from the wall or the ceiling.

According to an attachment method of the panel and a rail type fixing apparatus in accordance with the present invention, the operation of assembling and attaching the panel is performed very simply and rapidly with  
10 the fixing apparatus and it is not necessary to set the space when assembling the panels, so that even amateurs can perform the installation. Also, the present invention is very economical, since the labor cost and working hours can be reduced sharply.

Also, when the panel is shrunk or expanded in accordance with  
15 temperature variations after attachment of the panel, the deformation can be absorbed by the fixing apparatus, which is expanded and shrunk using the elastic member, so that there is no defect in accordance with temperature variations after the installation of the panel. In addition, since materials can be reused due to the fact that the panels can be separated without breaking  
20 them. Resources can be saved and pollution of the environment can be prevented.

Also, the panels can be attached to the wall and the ceiling simply and rapidly by fixing the rail of the fixing apparatus to the wall and the ceiling.